

APPENDIX No. 3.

REPORT ON THE TOPOGRAPHICAL SURVEY OF THE TONGARIRO MOUNTAINS.

SIR,—

Hamilton, June, 1891.

In compliance with your instructions of the 2nd of April last that I should, whilst in the neighbourhood of Tongariro, take the opportunity of making, as complete as possible, a topographical survey of the Tongariro Mountains, I have the honour to transmit herewith maps and drawings, and to report as follows:—

As you are aware, the survey was performed in conjunction with the inspection of the Rangipo subdivision surveys, situated round the east sides of the mountains, and having camped near their base I was enabled to take advantage of the best days for ascending the high peaks. The work has been done with considerable care and attention to detail; points were trigonometrically fixed on the summit of the mountains, the heights of which were determined from the major triangulation, and from these by checked aneroid readings the heights of the various craters and points of interest were obtained.

In the year 1887 I collected specimens of the rocks from these volcanoes, which were examined by Professor Thomas, and described by him in a paper read before the Auckland Institute on the 14th of November of that year. He also refers to them in his "Notes on the Geology of Tongariro and the Taupo District," which appear in the "Transactions of the New Zealand Institute," Vol. xxi., p. 334, from which I am enabled to classify the rocks of most of the lava streams described herein. Map No. 1, which shows the general topography of the district between Taupo Lake and Ruapehu, covering an area of 460 square miles, includes a portion of the country the survey of which I was prevented by unfavourable weather from completing on the occasion of my former visits to the neighbourhood. In Map No. 2, "The Plan of the Summit of Tongariro," I have endeavoured to show as clearly as possible the configuration of the mountain top, delineating especially the more recent lava streams and craters, in which probably the greatest interest will centre.

The craters of Ngauruhoe, the Red Crater, and Te Mari are the three vents from which (in the order mentioned) the latest discharges of lava have taken place. Reference to the map will show that they are (together with the Blue Lake Crater, Nga-Puna-a-Tama Crater, and the warm crater lake on the summit of Ruapehu) all in one straight line, and if the line be produced to the northwards it will pass through the boiling springs at Tokaanu. This line bears $36^{\circ} 30'$ east of north, and if it be still drawn northward, through the Lake country, it will be found to pass through the Whakarewarewa Springs and along the eastern side of Rotorua, in the direction of White Island. Steam is still issuing from Te Mari, the Red Crater, and, of course, from Ngauruhoe, whilst the crater lake on Ruapehu occasionally gives forth a column of steam. The lava streams from Ngauruhoe, the Red Crater, and Te Mari have all the same outward appearance, and apparently are much of the same age—the lava is dark, scoriaceous and heavy, having all the appearance of basalt. I have brought away with me specimens from each of these lava streams, which I hope to have examined within a short time. Tongariro, as seen from the westward, looks like a single great cone with a flat top, nearly three miles wide, with the tall symmetrical sugar-loaf peak of Ngauruhoe towering 7,500ft. high, just beyond its southern rim. As will be seen, however, it is composed of several distinct though dilapidated cones, the lava streams from which have so overlapped in their descent as to form one compact mountain mass at the base. The lower slopes of the mountain are composed of these lava streams; to the westward they spread out over the plateau in broad fan-shaped spurs, between which the streams forming the head tributaries of the Whanganui River take their rise. On the north side they run down to Rato Aira, a distance of 3 miles in sinuous and rather steep spurs, the hill sides being covered, in part, by forest. Round the lower slopes of the mountain on all sides tussock-grass, blue-grass, flax, and fern, and small herb-bearing plants, with bright blossoms and juicy edible berries, grow, the latter in greater abundance than I have seen them anywhere else except on the Kaimanawa Ranges. Large numbers of half-wild horses are at large on the lower slopes of the mountain, and, notwithstanding the great cold in the winter time, they seem to thrive well. Sheep fatten quickly, and excellent mutton is produced on the Tongariro slopes. The wild dogs, however, which inhabit the mountains, and seem to find refuge amongst the steep lava ridges, are a serious trouble to the sheep farmers, and, notwithstanding continuous efforts for years, they have failed to exterminate them. As yet there is little or no vegetation on the summit of the mountain, though surface soil is fast forming, which seems to be of a fertile nature, of a dark, soft, and somewhat spongy loam.

Seen from the eastward Tongariro has a very different appearance to that which it presents on the west. The mountain looks as if it had been cleft by three great rents, which, starting at the summit of the cone, score its sides in a south-east direction for about three miles. In these chasms the Mangahouhounui, Oturere and Waihohonu Streams rise; they are separated by great walls or ridges of rock, which may or may not have been distinct lava streams. In places these walls are 800ft. in height. At the head of the Mangahouhounui, close to the summit of the cone, the chasm spreads out into a crater-like basin, with vertical inward faces of rock which are deeply cleft in many places; the width of the basin is $1\frac{1}{2}$ miles, its depth is from 600ft. to 700ft. It appears like a crater, breached to the south-east where the Mangahouhounui flows, but whether it be so, or a space bounded by the walls of a number of smaller craters, I could not determine. At the head of the Oturere is such another basin as that which I have just described, only the latter is much larger, its width being over 2 miles; to the north its walls are 800ft. in height. They were unmistakably the interior of a crater, but whether it was of the great dimensions it would appear to be from the present configuration it is impossible to say. In wet weather this basin is occupied by a shallow lake.